THE HISTORICAL POSITION OF BAI

The Bai language in Yunnan presents some interesting challenges for Chinese historical linguistics. It is sometimes considered to be a Tibeto-Burman language infiltrated by several strata of Chinese loanwords — see, e. g., [Xu Lin 1984: 113–115]. On closer inspection, however, it turns out that there are virtually no Tibeto-Burman elements in Bai other than those having their counterparts in Chinese, too. In this paper I will try to show that Bai is, in fact, an archaic Chinese dialect, having separated from "mainstream" Chinese long before all other dialects (including Min) — somewhere around the late 1st millennium B.C. I base my study on the data in [Xu Lin 1984], mainly utilizing the evidence of the archaic Jianchuan dialect of Bai.

1. Phonological considerations

1a. Correspondences of tones.

The 4 Middle Chinese (MC) tones normally are reflected in Bai as follows:

	陰	陽	Nasal and liquid initials
平	4	7	4/7
上	1	1	1
去	2	3	2/3
入	6	2	6

There are some exceptions due to tonal sandhi or, sometimes, to later borrowings (in recent loanwords tones are reflected somewhat differently)

or misrecordings, but the overall system of tonal reflexes is quite clear (examples see below passim).

There is, however, one extremely interesting type of exceptions. Consider the following examples:

MC 二 *ńì* — Bai *ne*^{6} 'two'
MC 四 *sjì* — Bai *śi*^{6} 'four'
MC 外 *ŋwɑ̀j* — Bai *ŋua*^{6} 'outside'
MC 歲 *sjwèj* — Bai *sua*^{6} 'year'
MC 肺 *phwɑ̀j* — Bai *phia*^{6} 'lung'

All these words behave in Bai as if they had 入聲, i. e. ended in a stop. From Chinese historical phonology we know that Old Chinese (OC) had a front stop consonant (probably followed by *-*s*) here; it changed to a fricative around the 2d century B. C. and finally merged with *-*j* as late as in the 4th century A.D. [Старостин 1989: 456, 488]. Bai seems to reflect a stop here, thus pointing to a period not later than the 2d century B. C.

All the examples listed have voiceless or nasal initials; with voiced initials we would expect the Bai tone 2 in such cases. Indeed, we have the following evidence:

MC 吠 *bwɑ̀j* — Bai *pia*^{2} 'to bark'
MC 大 *dɑ̂j* — Bai *to*^{2} 'big'
MC 壞 *ɣwɑ̀j* — Bai *kuɛ*^{2} 'to destroy'
MC 胃 *wɨ̀j* — Bai *vu*^{2} 'stomach'

These examples also follow quite neatly the development of the entering tone; since, however, tone 2 is also a frequent reflex of the MC falling tone (去聲), they are ambiguous.

1b. Initial consonants.

The general system of correspondences between MC and Bai is as follows:

MC	Bai
p, b	*p*
ph	*ph*
m	*m* (*ŋ-* before *ü*)
w (= *ɦw*)	*v* (*ŋ-* before a nasal final consonant)
t, d	*t* (*ć-* before *-ie-* in the 4th division)

MC	Bai
th	*th* (*ćh-* before *-ie-* in the 4th division)
n	*n*
l	*ɣ* (*j-* before *i*, *n-* before a nasal final consonant)
ṭ, ḍ	*c/ć* (but *ṭ/t, ḍ* in the Bijiang dialect)
ṭh	*ch*
ṇ	*j* (with nasalisation of the following vowel)
c, ʒ	*c/ć*
ch	*ch/ćh*
s	*s/ś*
z	*c/ś* (but *j* in the Dali dialect)
ç, ʒ́	*c*
ṣh	*ch*
ṣ	*s*
ć, ʑ́	*c/ć* (but *ṭ, ḍ* in the Bijiang dialect)
ćh	*ch/ćh* (but *ṭh* in the Bijiang dialect)
ś	*s/ś*
ź, j	*c/s/j*
k, g	*k* (*ć* before *i*)
kh	*kh* (rarely *x*)
ŋ	*ŋ*
x	*x*
ɣ	a) *ɣ* (*ŋ-* before a final nasal, *v-* before *-w-*) b) *k*
ʔ	*Ø-* (*v-* before *u*, *j-* before *i*)

Some other reflexes of MC initials may be encountered and may be used to identify more recent loanwords from standard Chinese. They are:

a) *p-, ph-, b-* > *f-* (or *v-*) before central and front labialized vowels in the 3d division (等) (like 肥 MC *bwɨj* 'fat' > Bai *fɛ*^{6}, 蜂 MC *phöuŋ* 'bee' > Bai *fɯ̃*^{4}, 飛 MC *pwɨj* 'fly' > Bai *fɯ*^{4}; cf. more archaic examples like 肺 *phwàj* = Bai *phia*^{6} and 吠 *pwàj* = Bai *pia*^{6} above, as well as MC 浮 *bəw* 'float' = Bai *pɨ*^{2} and others);

b) velars > palatals in the 3d and 2d division (other than before the Bai vowel *i*), cf. 茄 MC *ga* > Bai *ćhi*^{4} 'egg-fruit', 球 MC *gəw* > Bai *ćho*^{2} 'a k. of jade', 假 MC *kạ́* > Bai *ća*^{3} 'to deceive' etc. Cf. the numerous more archaic examples like MC 甲 *kạp* > Bai *kɛ*^{6} 'nail, armor', MC 救 *kàw* > Bai *kɨ*^{2} 'to save', etc.;

c) voiced stops > aspirated stops in 平聲 (cf. the words for 'egg-fruit' and 'jade' above);

d) *l-* > *l-*, cf. 量 MC *laŋ* > Bai *liã* ‘a measure of capacity’, 綠 MC *löuk* > Bai *lü*^{6} ‘green’ etc., as opposed to more archaic cases: MC 鐮 *lem* — Bai *jĩ*^{7} ‘sickle’, MC 柳 *láw* — Bai *ɣɨ*^{1} ‘willow’, MC 力 *lik* — Bai *ɣɨ*^{2} ‘sinew, strength’, MC 來 *lʌj* — Bai *ɣɨ*^{1} ‘to come’, MC 漏 *lʌ̀w* — Bai *ɣɨ*^{3} ‘to leak’, MC 六 *lük* — Bai *fü*^{6} ‘six’ (here Bai has a voiceless reflex, which seems to support the reconstruction **rh-* for this word, based on Min evidence).

The last point is especially interesting because of the specific correspondence *l-* : *ɣ-*. From Chinese historical phonology we know that MC *l-* goes back to OC **r-* that changed to *l-* in the beginning of the 1st millennium A. D. (probably around the 3rd century), after the development of original **l-* and **l̥-* into *d-*, *th-* [Старостин 1989: 476]. The Bai reflex *ɣ-* is much easier explained from **r-* than from *l-*, which also pushes the time of the divergence of Bai from “mainstream” Chinese to a date earlier than MC.

However, as we stated above, MC *d-* and *th-* are in most cases rendered as dentals in Bai, which seems to be the standard development. Nevertheless, there are a few very interesting cases:

蝴蝶 MC *ɣo-diep* (< OC **gā-lēp*) ‘butterfly’ : Bai *ko*^{4}*-li*^{6};

退 MC *thòj* (< OC **s-lūj-s*) ‘to withdraw, retire’ : Bai *lo*^{3};

脫 MC *thwât*, *thwɑ̀j* (< OC **s-lōt*, **s-lōt-s*) ‘to take off, let loose’ : Bai *lui*^{4};

錫 MC *siek* (< OC **s-lhēk*) ‘tin’ : Bai (Bijiang dialect) *la*^{6}.

These examples may represent an extremely archaic layer in Bai, later superceded by the standard Chinese dental reflexes. It is also worth noting that words containing the OC lateral initials sometimes reveal other irregularities in Bai: notably, MC *d-* going back to **l(h)-* can be reflected as *th-*, cf.

道 MC *dɑ́w* (< OC **lhū?*) ‘road’ : Bai *thu*^{1};

弟 MC *díej* (< OC **Ł(h)ājʔ*) ‘younger brother’ : Bai *thi*^{1},

while MC *th-* going back to **sl(h)-* can be reflected as *x-* or *s-*, cf.

湯 MC *thâŋ* (< OC **ƛ(h)āŋ*) ‘warm water’ : Bai *xɛ̃*^{4};

痛 MC *thùŋ* (< OC **slōŋ-s*) ‘pain, sickness’ : Bai *sũ*^{3};

天 MC *thien* (< OC **[sl]īn*, although here the initial is not quite certain) ‘sky’ : Bai *xɛ̃*^{4}.

There are also some other interesting moments in the consonant system of Bai (such as complete confusion of the reflexes of MC *j* and *ź* — which is a MC innovation; a distinction of **gh-* > *ɣ-* and **g-* > *k-* that was lost in MC), which, however, are difficult to use for the dating of the Bai-MC split.

1c. The system of finals.

The MC finals have the following correspondences in Bai.

MC 東: [A] *-uŋ* : *-ũ̃* [/*-õ* in late loanwords]; [B] *-uk* : *-ü* [/*-o* in late loanwords]; [C] *-üŋ* : 1) *-ũ̃* if it goes back to OC **-uŋ*, cf. 蟲 MC *ḍüŋ*, OC **Łhuŋ* 'insect' : Bai *cũ̃*^{7}; 2) *-ɨ̃* or *-õ* if it goes back to OC **-əŋ*, cf. 夢 MC *mə̀ŋ*, OC **mhəŋ-s* 'to dream' : Bai *mɨ̃*^{3}, 弓 MC *küŋ*, OC **k^{w}əŋ* 'bow' : Bai *kõ*^{4}; [D] *-ük* : 1) *-ü* if it goes back to OC **-uk*, cf. 六 MC *lük*, OC **rhuk* 'six' : Bai *fü*^{6}, 熟 MC *ʑük*, OC **duk* 'be ripe' : Bai *cü*^{2}; 2) *-o* if it goes back to OC **-ək*, cf. 蝠 MC *pük*, OC **pək* 'bat' : Bai *po*^{6}.

MC 冬: [A] *-oŋ* : *-ũ̃* [/*-õ* in late loanwords]; [B] *-ok* : (unknown).

MC 鐘: [A] *-öüŋ* : *-ũ̃* [/*-õ* in late loanwords]; [B] *-öük* : *-ü*.

MC 江 [A] *-ạuŋ* : *-ũ̃* [/*-õ* or *-uã̃* in late loanwords] (only reflexes of OC **-rōŋ* are known, cf. 江 MC *kạuŋ*, OC **krōŋ* 'river' : Bai *kũ̃*^{4}); [B] *-ạuk* : 1) *-ü* if it goes back to OC **-rōk*, cf. 角 MC *kạuk*, OC **krōk* 'horn' : Bai *kü*^{6}; 2) *-ɨ* if it goes back to OC **-rūk*, cf. 學 MC *ɣạuk*, OC **ghrūk* 'to learn' : Bai *ɣɨ*^{2}.

MC 陽: [A] *-aŋ* : *-õ* [/*-ã̃* or *-iã̃* in late loanwords]; [B] *-ak* : *-o* [/*-a* in late loanwords].

MC 唐: [A] *-âŋ* : *-õ* ~ *-ɛ̃* with a not quite clear distribution; [B] *-wâŋ* : *-ũ̃* ~ *-uã̃* (also with unclear distribution); [C] *-âk* : *-o*; [D] *-wâk* : *-ua*.

MC 庚: [A] *-ạiŋ* : *-ɛ̃*; [B] *-ạik* : *-ɛ*; [C] *-äiŋ* : *-ɛ̃*.

MC 耕: [A] *-ạiŋ* : (unknown); [B] *-ạik* : 1) *-i* if it goes back to OC **-rēk*, cf. 脈 MC *mạik*, OC **mhrēk* 'vein' : Bai *mi*^{6}; 2) *-ɨ* if it goes back to OC **-rək*, cf. 麥 MC *mạik*, OC **mrək* 'wheat' : Bai *mɨ*^{6}.

MC 清: [A] *-ieŋ* : *-ɛ̃* (rarely *-ĩ*); [B] *-iek* : *-ɛ* (rarely *-i*).

MC 青: [A] *-jeŋ* : *-ɛ̃*; [B] *-jek* : *-ɛ*. [In a few cases *-iek* and *-jek* are reflected as back *-o* or *-a*, cf. MC 石 *ʑek* — Bai *co*^{2} 'stone', MC 滴 *tiek* : Bai *to*^{6} 'drop'; the reasons for this split are unclear, and do not seem to be conditioned by any OC distinctions.]

MC 蒸: [A] *-iŋ* (= *-iŋ*) : *-ɨ̃*; [B] *-ik* (= *-ik*) : *-ɨ* (/*-i* in late loanwords).

MC 登: [A] *-ʌŋ* : *-ɨ̃*; [B] *-ʌk* : *-ɨ*.

MC 侵: [A] *-im* (= *-im*) : *-ɛ̃* ~ *-ɨ̃* (with a not quite clear distribution); [B] *-ip* (= *-ip*) : *-ɛ*.

MC 覃: [A] *-ʌm* : *-ã̃*; [B] *-ʌp* : *-a*.

MC 談: [A] *-âm* : *-ã̃*; {B] *-âp* : (unknown).

MC 鹽: [A] *-em* : *-ẽ* ~ *-ĩ*; [B] *-ep* : *-a* ~ *-i*.

MC 添: [A] *-iem* : *-ĩ*; [B] *-iep* : *-i* ~ *-a*.

MC 咸: [A] *-ạ̈m* : (unknown); [B] *-ạ̈p* : (unknown).

MC 銜: [A] *-ạm* : (unknown); [B] *-ạp* : *-a* ~ *-ɛ* (with unclear distribution).

MC 嚴, 凡: [A] *-əm* : (unknown); [B] *-əp* : (unknown).

MC 真: [A] *-in* : *-ĩ* [/*-ɛ̃* in late loanwords]; [B] *-win* : *-ũ̃* ~ *-uĩ*; [C] *-it* : *-i*; [D] *-wit* : *-i* ~ *-ü* (here belongs also 蜜 MC *mjit* : Bai *ŋü*[1] 'honey').

MC 殷: [A] *-ɨn* : *-ĩ*; [B] *-ɨt* : (unknown).

MC 文: [A] *-ün* : *-ũ̃* ~ *-õ*; [B] *-üt* : (unknown).

MC 魂: [A] *-on* : *-(u)ã* ~ *-ẽ*; [B] *-ot* : *-ua*.

MC 痕: [A] *-ʌn* : *-uɛ̃*; [B] *-ʌt* : (unknown).

MC 元: [A] *-ən* : *-ẽ*; [B] *-wən* : *-ũ̃*; [C] *-wət* : *-ua*.

MC 寒: [A] *-ân* : *-ã*; [B] *-ât* : *-a*.

MC 刪: [A] *-ạn* : *-ɛ̃*; [B] *-ạt* : *-a*.

MC 山: [A] *-ɐ̈n* : *-ũ̃* / *-uĩ*; [B] *-ɐ̈t* : *-(i)a*.

MC 先: [A] *-ien* : *-ẽ* (sometimes probably misspelled as *-ɛ̃*) /*-ĩ*; [B] *-iet* : *-e*. [In a few cases *-ien* and *-iet* can be reflected as *-ã*, *-a*, cf. MC 田 *dien* : Bai *tã*[3] 'field', MC 犬 *khwien* : Bai *khuã* 'dog', MC 血 *xwiet* : Bai *sua*[6] 'blood'; reasons for this split are not clear.]

MC 仙: [A] *-en* : *-ĩ*; [B] *-wen* : *-uĩ*; [C] *-et* : *-e* ~ *-i*; [D] *-wet* : *-ua*.

MC 支: [A] *-e* : *-e* / *-ɨ* [*-i* in late loanwords]; [B] *-we* : *-ü*/*-ui*.

MC 脂: *-i* : *-i* (*-e* after nasals).

MC 之: *-ɨ* : *-ɨ* [*-i* in later loanwords].

MC 微: [A] *-ɨj* : *-i*; [B] *-wɨj* : *-ü*.

MC 齊: *-iej* : *-e* (*-i* after dental stops).

MC 祭: [A] *-ej* : *-i*; [B] *-wej* : *-ua*.

MC 廢: *-əj* : *-(i)a*.

MC 佳: [A] *-ɐ̈* : *-ɛ*; [B] *-wɐ̈* : *-ua*.

MC 皆: *-ɐ̈j* : *-ɛ*.

MC夬: *-ạj* : (unknown).

MC 灰: *-oj* : *-ui* ~ *-e*.

MC 哈: *-ʌj* : *-ɨ* / *-e*.

MC 泰: [A] *-âj* : *-o*; [B] *-wâj* : *-ua*.

MC 歌: [A] *-â* : *-o*; [B] *-wâ* : *-(u)o*.

MC 麻: [A] *-ạ* : *-ɛ* ~ *-o*; [B] *-wạ* : *-uɛ* ~ *-ua*.

MC 魚: *-ö* : *-ü*.

MC 虞: *-ü* : *-ɨ* (after labials sometimes also *-u*, *-o*).

MC 模: *-o* : *-u* ~ *-o* (after labials sometimes also *-ɨ*).

MC 侯: *-ʌw* : *-ɨ* (sometimes also *-u*, *-o* after labials and velars).

MC 尤: *-əw* : *-ɨ* [/*-u*, *-o* in later loanwords].

MC 幽: *-iw* : (unknown).

MC 蕭: *-iew* : *-o*.

MC 宵: *-ew* : *-o* ~ *-u* (*-(i)ao* in later loanwords).

MC 肴: *-ạw* : 1) *-u* if it goes back to OC **-rū*, cf. 炒 MC *ʈʰɣ̄w*, OC **chrūʔ* 'to roast' : Bai *chu*[1]; 飽 MC *pɣ̄w*, OC **prūʔ* 'be satiated' : Bai *pu*[1]; 2) *-a* if it goes

back to OC *-*rāw* or *-*rēw*, cf. 豹 MC *pàw*, OC **prē(k)w-s* 'leopard' : Bai *pã*^{2} (with rather frequent secondary nasalisation); 咬 MC *ŋáw*, OC **ŋhrāw*ʔ 'to bite' : Bai *ŋa*^{6}.

MC 豪: *-âw* : 1) *-u* (sometimes *-uɛ*) if it goes back to OC *-*ū*, cf. 抱 MC *bấw*, OC **bhūʔ* 'to carry in arms' : Bai *pu*^{1}; 早 MC *cấw*, OC **cūʔ* 'early' : Bai *cu*^{1}; 道 MC *dấw*, OC **lhūʔ* 'road' : Bai *thu*^{1}; 草 MC *chấw*, OC **chūʔ* 'grass' : Bai *chu*^{1}; 好 MC *xấw*, OC **xūʔ* 'be good' : Bai *xu*^{1}; 靠 MC *khầw*, OC **khū(k)-s* 'to lean upon' : Bai *khuɛ*^{4}; 2) *-a* if it goes back to OC *-*āw*, cf. 盜 MC *dầw*, OC **d(h)āw-s* 'to rob' : Bai *ta*^{3}; 桃 MC *dâw*, OC **Łhāw* 'peach' : Bai *ta*^{7}; 毛 MC *mâw*, OC **mhāw* 'hair' : Bai *ma*^{7}; 刀 MC *tâw*, OC **tāw* 'knife' : Bai *tã*^{4}; 高 MC *kâw*, OC **kāw* 'high' : Bai *kã*^{4}

The distinction between *-*ū* and *-*āw* may be at the latest observed in the history of the Chinese language in the 3d century A. D. (they still form separate rhyme classes in the verses of Ji Kang and Yuan Ji, but have merged completely in the 4th century in the rhymes of Tao Yuanming and Xie Lingyun; see [Juhl 1973; Старостин 1989: 488]).

Phonetic analysis, therefore, leads us to a conclusion that the ancestor of the Bai language must have split from Old Chinese somewhere between the 2nd century B. C. and the 4th century A. D. A more precise date is, of course, hard to establish, because the particular ancestor dialect of Bai could have been more advanced than other Chinese dialects of that time (or vice versa), and we know too little about Old Chinese dialects.

2. Lexicostatistical considerations

Below I adduce Swadesh's standard 100-wordlist for Baihua, Bai, Fuzhou and Hakka (plus 10 additional items from Yakhontov's 35-word-list). Corresponding items are marked by identical numbers; loanwords are marked by negative numbers; missing items are marked by –666.

Word	**Baihua**	**№**	**Bai**	**№**	**Fuzhou**	**№**	**Hakka**	**№**
all	都 dōu	1	ca^{5}kɛ^{7}, ci^{1}	2	tou^{52}	1	du^{1}	1
ashes	灰 hūi	3	xui^{4}	3	hui^{55}	3	foi^{1}	3
bark	皮 pí	4		–666	chiu^{31}phui^{52}	4	su^{4}pi^{2}	4
belly	肚子 dùzi	5	fü^{6}	–1	pu^{31} lo^{52}	5	du^{3} s^{3}	5
big	大 dà	6	to^{2}	6	tuai^{242}	6	tai^{4}	6
bird	鳥 niǎo	7	vu^{4}co^{6}	7	ceu^{33}	7	vu^{4}co^{6}	7
bite	咬 yǎo	8	ŋa^{6}	8	ka^{242}	9	ŋau^{1}	8

Word	Baihua	№	Bai	№	Fuzhou	№	Hakka	№
black	黑 hēi	10	xɨ^{6}	10	u^{55}	11	u^{1}	11
blood	血 xuè	12	sua^{6}	12	haik^{23}	12	hiat^{5}	12
bone	骨頭 gǔtou	13	kua^{6}tɨ^{7}	13	kouk^{23}	13	gut^{5}-teu^{2}	13
breast	乳房 rǔfáng	14	ɲa^{2}	15	neiŋ^{52}	16	nen^{4}-gu^{1}	16
breast	奶 nǎi	17		0		0		0
burn	燒 shāo	18		–666	ɕiu^{55}	18	seu^{1} fo^{3}	18
claw	指甲 zhījia	19	sɨ^{1}tɨ^{7}kɛ^{6}	19	cieŋ^{55}ŋak^{23}	19	su^{3}z^{3}gap^{5}	19
cloud	雲 yún	20	ŋü^{7}	20	huŋ^{52}chai^{31}	20	iun^{2}	20
cold	寒 hán	21	kɨ^{4}	22	cheiŋ^{33}	23	hon^{2}	21
come	來 lái	24	ɣɨ^{2}	24	li^{52}	24	loi^{2}	24
die	死 sǐ	25	śi^{1}	25	ɕi^{33}	25	si^{3}	25
dog	狗 gǒu	26	khuã^{1}	27	kheiŋ^{55}	27	geu^{3}-ui^{3}	26
drink	喝 hē	28	ɨ̃^{4}	29	chüok^{23}	30	im^{3}	29
dry	乾 gān	31	kã^{4}	31	ta^{55}	32	gon^{1}-ne^{4}	31
ear	耳朵 ěrduo	33	jɨ̃^{1} tɨ^{7}kuã^{4}	33	ŋai^{242}	33	ŋi^{3}-guŋ^{1}	33
earth	土地 tǔdì	34	ći^{3}	34	tai^{242}	34	tu^{3}-ti^{4}	34
eat	吃 chī	35	jɨ^{6}	36	ɕiek^{5}	36	st^{6}	36
egg	卵 luǎn	37	sẽ^{2}	38	louŋ^{242}	37	lon^{3}	37
eye	眼 yǎn	39	ŋui^{1}	40	möük^{3}ciu^{55}	41	muk^{5}-zu^{1}	41
fat	脂肪 zhīfang	42	ci^{4}	42	cie^{55}	42	iu^{2}	43
feather	羽毛 yǔmáo	44		–666	ü^{31}mou^{52}	44	mo^{1}	45
fire	火 huǒ	46	xui^{1}	46	hui^{33}	46	fo^{3}	46
fish	魚 yú	47	ŋü^{4}	47	ŋü^{52}	47	ŋ^{2}	47
fly	飛 fēi	48	fü^{4}	–2	pui^{55}	48	bi^{1}	48
foot	腳 jiǎo	49	ko^{6}	49	kha^{55}	–1	giok^{5}pan^{1}	49
full	滿 mǎn	50	ma^{1}	50	muaŋ^{33}	50	man^{1}	50
give	給 gěi	51		–666	khöük^{23}	52	bun^{1}	53
good	好 hǎo	54	xu^{1}, kɛ^{6}	54	ho^{33}	54	ho^{3}	54
green	綠 lǜ	55	lü^{6}	55	luok^{5}	55	liuk^{6}	55
hair	毛 máo	56	ma^{7}	56	mou^{52}	56	mo^{1}	56
hand	手 shǒu	57	sɨ^{1}	57	chiu^{33}	57	su^{3}	57
head	頭 tóu	58	tɨ^{7}po^{7}	58	thau^{52}	58	teu^{2}-na^{2}	58
hear	聽 tīng	59	ćhɛ̃^{4}	59	thiaŋ^{55}	59	taŋ^{1}	59
heart	心 xīn	60	śĩ^{4}	60	ɕiŋ^{55}	60	sim^{1}-gon^{1}	60
horn	角 jiǎo	61	kü^{6}	61	koük^{23}	61	gok^{5}	61
I	我 wǒ	62	ŋo^{3}	62	ŋuai^{33}	62	ŋai^{2}	62

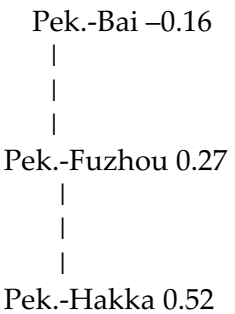
Word	Baihua	№	Bai	№	Fuzhou	№	Hakka	№
kill	殺 shā	63	śa^{6}	63		–666	sat^{5}	63
knee	膝頭 xitou	64		–666		–666	cit^{5}-teu^{2}	64
know	知道 zhīdao	65	sẽ^{1}	66		–666	di^{1}	65
leaf	葉子 yèzi	67	se^{6}	67	nuok^{5}	67	iap^{6}-bi^{3}	67
lie	臥 wò	68		–666	to^{33}	69	min^{2}den^{3}	70
liver	肝 gān	71	kã^{4}	71	kaŋ^{55}	71	gon^{1}	71
long	長 cháng	72	cõ^{2}	72	touŋ^{52}	72	coŋ^{2}	72
louse	蝨子 shizi	73	śi^{6}	73	ʚaik^{23}mo^{31}	73	sep^{5}-ma^{2}	73
man	男人 nánrén	74	ci^{1}jĩ^{7}	75	naŋ^{33}nöüŋ^{52}	74	nam^{2}-ŋin^{2}	74
many	多 duō	76	ći^{4}	77	sa^{242}	78	do^{1}	76
meat	肉 ròu	79	kɛ^{7}	80	lük^{5}	79	ŋiuk^{5}	79
moon	月 yuè	81	mi^{4}ŋua^{6}	81	ŋuok^{5}luoŋ^{242}	81	ŋiat^{6}guoŋ^{1}	81
mountain	山 shān	82	sü^{2}	82	ʚaŋ^{55}	82	san^{1}	82
mouth	嘴 zuǐ	83	ćui^{1}kɛ^{4}	83	chui^{31}	83	zoi^{4}	83
name	名字 míngzì	84	miɛ^{4}	84	miaŋ^{33}cei^{242}	84	miaŋ^{2}-c^{4}	84
neck	頸脖 jǐngbo	85		–666	ta^{5}au^{33}	86	gian^{3}-gin^{1}	85
new	新 xīn	87	śĩ^{4}	87	ʚiŋ^{55}	87	sin^{1}	87
night	夜 yè	88	xẽ^{4}miɛ^{7}	89	maŋ^{55}muo^{55}	90	ban^{4}-ia^{4}	88
nose	鼻子 bízi	91	ŋü^{2}khü^{6}ti^{7}	92	phei^{31}	91	pi^{4}-guŋ^{1}	91
not	不 bù	93	a^{3}, a^{5}, ja^{5}	94	me^{52}	95	m^{2}	95
one	一 yī	96	ji^{6}, ji^{5}, a^{5}	96	ʚuok^{23}	97	it^{5}	96
person	人 rén	98	jĩ^{7}	98	nöüŋ^{52}	98	ŋin^{2}	98
rain	雨 yǔ	99	vu^{1}śui^{1}	99	ü^{31}	99	i^{3}	99
red	紅 hóng	100	chɛ^{6}	101	öüŋ^{52}	100	fuŋ^{2}	100
road	道 dào	102	thu^{1}	102		0		0
road	路 lù	103		0	lou^{242}	103	lu^{4}	103
root	根 gēn	104	mi^{6}	105	chiu^{31}küŋ^{55}	104	gin^{1}	104
round	圓 yuán	106	ŋui^{7}	106	ieŋ^{52}	106	ian^{2}-ne^{4}	106
sand	沙 shā	107	so^{4}ci^{1}	107	ʚai^{55}	107	sa^{1}	107
say	話 huà	108			kouŋ^{55}ua^{242}	108	goŋ^{3}fa^{4}	108
say	說 shuō	109	sua^{6}	109		0		0
see	看 kàn	110	xã^{4}, ã^{4}	110	khaŋ^{31}	110	kon^{4}	110
seed	種 zhǒng	111	cữ^{1}	111	cüŋ^{55}ci^{52}	111		0
seed	籽 zǐ	112		0		0	z^{3}	112
sit	坐 zuò	113	kü^{2}	114	ʚuoi^{242}	113	co^{1}	113
skin	皮膚 pífū	115	pe^{7}	115	phui^{52}	115	pi^{2}	115

Word	Baihua	№	Bai	№	Fuzhou	№	Hakka	№
sleep	睡 shuì	116	chɛ̃[1]	117	khouŋ[31]	118	soi[4]-muk[5]	116
small	小 xiǎo	119	se[3]	120	nouŋ[242]	121	se[4]	120
smoke	煙 yān	122	xui[1]śɛ̃[4]	122	hui[33]ieŋ[55]	122	ian[1]	122
stand	站 zhàn	123	ci[3], xi[4]	124	khie[242]	124	ki[1]	124
star	星 xīng	125	śɛ̃[4]	125	ʂiŋ[55]	125	sen[1]-ŋi[3]	125
stone	石頭 shítou	126	co[2]khui[4]	126	ʂuok[3]thau[52]	126	sak[6]-teu[2]	126
sun	日頭 rìtou	127	jĩ[6]phĩ[3]	127	lik[3]thau[52]	127	ŋit[5]-teu[2]	127
swim	游水 yóushǔi	128		–666	ʂiu[31]cui[52]	128	ciu[2] se[3]	128
tail	尾巴 wěiba	129	ŋü[1]tũ[4]	129	mui[33]	129	mi[1]-ba[1]	129
that	那 nà	130	mi[3]	131	hi[52]eik[23]	132	ge[4]-ge[4]	133
this	這 zhè	134	li[3]	135	ci[52]eik[23]	134	li[3]-ie[4]	136
thou	你 nǐ	137	no[3]	137	nö[33]	137	ŋ[2]	137
tongue	舌頭 shétou	138	ce[2]	138	chui[31]liek[5]	138	sat[6]-ma[2]	138
tooth	牙 yá	139	ci[1]pa[6]	140	ŋai[33]	139	ŋa[2]	139
tree	樹 shù	141	ci[3]	141	chiu[31]	141	su[4]-ui[3]	141
two	二 èr	142	kõ[1], ne[6]	142	naŋ[242], nei[242]	142	ŋi[4]	142
walk	走 zǒu	143		–666	kho[31]	144	hi[4]	144
warm	暖和 nuǎnhuo	145	uĩ[4]vu[6]	146	nuoŋ[33] huo[52]	145	non[1]	145
water	水 shǔi	147	śui[1]	147	cui[52]	147	se[3]	147
we	我門 wǒmen	148	ŋa[4]	148	ŋuai[55]	148	ŋai[2]-deu[2]	148
what	甚麼 shémma	149	a[4]sɛ̃[3]	149	ʂieŋ[52]nok[23]	149	mak[5]-ge[4]	150
white	白 bái	151	pɛ[2]	151	pak[5]	151	pak[6]	151
who	誰 shúi	152	a[3]to[7]	153	tak[3]nöüŋ[24]	153	man[3]-ŋin[2]	150
woman	女人 nǚrén	154	jũ[1]jĩ[7]	154	nü[55]ai[31]	154	ŋ[3]-ŋin[2]	154
yellow	黃 huáng	155	ŋü[7]	155	uoŋ[52]	155	uoŋ[2]	155
far	遠 yuǎn	156	tuĩ[1]	157	huoŋ[242]	156	ian[3]	156
heavy	重 zhòng	158	cũ[1]	158	töüŋ[242]	158	cuŋ[1]	158
near	近 jìn	159	ćĩ[1]	159	köüŋ[242]	159	kiun[1]	159
salt	鹽 yán	160	pĩ[4]	161	ʂieŋ[52]	160	iam[2]	160
short	短 duǎn	162	chi[4]	163	töü[33]	162	don[3]	162
snake	蛇 shé	164	khü[1]	165	ʂie[52]	164	sa[2]-go[1]	164
thin	薄 báo	166	po[2]	166	pok[5]	166	pok[6]	166
wind	風 fēng	167	pi[4]si[4]	168	huŋ[55]	–666	fuŋ[1]	169
worm	蟲 chóng	170	cũ[7]	170	thöüŋ[52]	170	cuŋ[2]-ŋi[3]	170
year	年 nián	171		0	nieŋ[52]	171	ŋian[2]	171
year	歲 sùi	172	sua[6]	172		0	se[4]	172

The calculating technique that I employ was described in [Старостин 1989a], now implemented as a computer program. The table of percentages looks like this:

	Bai	Fuzhou	Hakka
Baihua	0.70	0.78	0.83
Bai	–	0.68	0.68
Fuzhou	–	–	0.79

which gives us the following tree diagram for the four idioms in question (dates are given in millennia B.C. and A.D.):



We see, therefore, that glottochronology coincides rather well with phonological estimations of the divergence of Bai and Chinese.